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NAB LITTLE CREEK
5090.3a

TECHNICAL MEMORANDUM WORK PLAN FOR PRE-CONFIRMATION LEAD SOIL
SAMPLING AT SOLID WASTE MANAGEMENT UNIT 3 PIER 10 SANDBLAST YARD NAB
LITTLE CREEK VIRGINIA BEACH VA
6/27/2013
CH2M HILL

Work Plan for Pre-Confirmation Lead Soil Sampling SWMU 3, Pier 10 Sandblast Yard, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia

PREPARED FOR: Joint Expeditionary Base Little Creek Partnering Team

PREPARED BY: CH2M HILL

DATE: June 27, 2013

Introduction

This Technical Memorandum Work Plan presents the field investigation approach to delineate elevated lead concentrations in soil in support the Time-Critical Removal Action (TCRA) for Environmental Restoration (ER) Program Solid Waste Management Unit (SWMU) 3, Pier 10 Sandblast Yard, Joint Expeditionary Base (JEB) Little Creek, Virginia Beach, Virginia. A location map of SWMU 3 at JEB Little Creek is shown in **Figure 1**. This Work Plan was developed for the Naval Facilities Engineering Command Mid-Atlantic Division under the Comprehensive Long-term Environmental Action—Navy Contract N62470-02-D-3052, Contract Task Order WE34. Although no potentially unacceptable risk from exposure to site soil has been identified, the Navy is proactively addressing areas of elevated lead concentrations [>400 milligrams per kilogram (mg/kg)] to further eliminate the potential for any future exposure. The project quality objective for this field investigation is to delineate the lateral and vertical removal boundaries to address elevated lead concentrations of lead in soil. .

Detailed information on the JEB Little Creek mission, physiographic and demographic features of the Base and surrounding area, and implementation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) ER Program is provided in the most recent Site Management Plan (CH2M HILL, 2012c).

SWMU 3 Background and History

Site History

SWMU 3, the Pier 10 Sandblast Yard, is located in a developed area on Little Creek Harbor's western side (**Figure 1**). The terrestrial portion of SWMU 3 includes a fenced area containing Buildings 1262, 1263 and 1268, used as a fire firefighting equipment storage shed, repair shop, and wood storage area, respectively (**Figure 2**). Two concrete pads formerly used for sandblasting operations are also located within the fenced area. Within the fenced area, the ground surface is generally covered in concrete, asphalt, or gravel. Little to no vegetation covers unpaved areas. A small, grassy picnic area is located outside the fence. Surface runoff from the site is conveyed to Little Creek Harbor via a catch basin connected to a Virginia Pollution Discharge Elimination System (VPDES)-permitted outfall (VPDES permit #VA0079928, Outfall 008), located under Pier 10, approximately 35 feet from its easternmost edge. Under the current VPDES permit, VA0079928, Outfall 008 is defined as a stormwater outfall and has no monitoring requirements. Additionally, a portion of the stormwater runoff from SWMU 3 flows directly into Little Creek Harbor as sheet flow. The aquatic portion of the site, located in Little Creek Harbor, consists of the Pier 10 floating dry dock and its associated anchoring system, as well as a recreational marina used by military dependents and former active duty service members. In addition to floating dry dock activities, Little Creek Harbor is currently used for dive team training. A public health restriction on shellfish consumption and a fish consumption advisory are currently in place for Little Creek. For security purposes recreational swimming is not permitted in Little Creek Harbor; however, the facility currently allows recreational fishing from the pier located behind Building 1604.

SWMU 3 was used for sandblasting boats between 1962 and 1984. Sandblasting activities took place on a 0.04-acre concrete pad located to the west of Building 1263 (RGH, 1984). After 1984, anchors and chains were sandblasted on the concrete pad. The used sandblasting material was periodically sampled and the results

indicated the sandblast residue was not hazardous. Paint chips and blast grit covered the unpaved ground south of the pad to the water's edge and the near-shore bottom of Little Creek Harbor. In 1982, a fence was installed around the sandblasting area to limit access to the site and to minimize windblown sandblasting materials from migrating outside the fenced area. In 1995, the 0.04 acre concrete pad was taken out of service, and a new sandblasting area was constructed in the northwestern corner of the site. The new sandblasting area consisted of a 0.4-acre concrete pad surrounded by a 4- to 5-foot-high concrete wall. In 1996, all sandblasting operations at SWMU 3 ceased when a new indoor sandblasting facility, Building CB125, was completed adjacent to SWMU 7b.

Historical releases from SWMU 3 likely occurred from accumulation of sandblast residue lying directly on the ground surface. Prior to 1993, runoff from sandblasting operations occurred as sheet flow to Little Creek Harbor. In 1993, a catch basin connected to a VPDES-permitted outfall was constructed to receive runoff from various areas. Following construction of the new concrete pad surrounding the catch basin, surface water drainage from the more recent sandblasting area flowed to this catch basin and emptied into Little Creek Harbor via Outfall 008. Currently, residual abrasive blast material is present on the unpaved ground surface south of the concrete pads to the water's edge and in Little Creek Harbor sediment in the vicinity of Pier 10, the recreational marina, and south to Pier 8.

No potentially unacceptable risks to human health from exposure to soil, surface water, or sediment at SWMU 3 were identified (CH2M HILL, 2009). No potentially unacceptable risks to human health associated with direct exposure or potable use of groundwater (CH2M HILL, 2012b) or vapor intrusion from VOCs in groundwater (CH2M HILL, 2013) was identified. Although no potentially unacceptable site-wide risk was identified from exposure to soil, localized areas of elevated lead concentrations (>400 mg/kg) were identified, primarily along the rip-rap shoreline. No potentially unacceptable ecological risks from exposure to groundwater, soil, or surface water were identified at SWMU 3 (CH2M HILL, 2009). Potentially unacceptable risks to lower-trophic-level receptors from exposure to copper, lead, nickel, tin, and zinc in sediment were identified and require action (CH2M HILL, 2012a).

Although no potentially unacceptable risk from exposure to site soil has been identified, the Navy is proactively addressing areas of elevated lead concentrations (>400 mg/kg) to further eliminate the potential for any future exposure. Based on data collected as part of the Remedial Investigation (CH2M HILL, 2005), the proposed soil removal area is depicted in **Figure 3**. As part of removal action activities, a retention swale will be constructed within the excavation around sample locations LW03-SO126 and LW03-SO127. The feature will span the distance between the pavement and rip-rap and run approximately 170 feet along the shoreline (**Figure 4**). The retention feature will serve to retain and filter runoff from the adjacent parking lot.

Field Sampling Activities

All field sampling will be conducted in accordance with the standard operating procedures (SOPs) outlined in the Master Project Plans (CH2M HILL, 2007). The applicable SOPs are provided in **Attachment A**.

Pre-mobilization

The following subcontractors will be procured to implement the soil sampling field investigation:

- Analytical laboratory
- Driller with direct-push technology (DPT) (pre-confirmation sampling only)
- Utility locator (pre-confirmation sampling only)
- Investigation-derived waste (IDW) handler

Mobilization for the field effort will include procurement of necessary field equipment and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Prior to beginning any phase of work, CH2M HILL will conduct field meetings to discuss the work items, worker responsibilities, and familiarize workers with the Health and Safety Plan. Before any intrusive activities are initiated, all appropriate permits (dig permit, etc.) will be obtained, and the site will be marked for subsurface utilities. CH2M HILL will coordinate subsurface utility clearances with Miss Utility of Virginia. A third-party utility-

locating subcontractor will be procured to verify the utility markings. No intrusive activities will be initiated until the utility clearance has been completed.

Soil Sampling

Surface and subsurface soil samples will be collected to delineate the lateral and vertical extent of lead concentrations in soil exceeding 400 mg/kg. Sampling will be conducted along transects as follows:

- **Transects A, B, and C:** Within the grassy area west of the fenced compound, discrete samples will be collected along Transects A, B, and C (**Figure 4**) in 10 foot lateral intervals to confirm the presence or absence of elevated lead concentrations in soil, and, if present delineate the lateral and vertical extent of required excavation in this area.
- **Transects D, E, and F:** The western limits of elevated lead concentrations in soil along the shoreline will be defined by collecting discrete samples along Transects D, E, and F in 10 foot lateral intervals to determine if additional excavation is required, and if so, determine the lateral and vertical extent of the required excavation (**Figure 4**).
- **Transects G and H:** Within the retention swale area, discrete samples will be collected along Transects G and H in 25 foot intervals to determine the vertical extent of removal required in this area (**Figure 4**).

Soil samples collected beneath paved surfaces during the RI indicate lead is present at a maximum concentration of 13.5 mg/kg (Figure 3) and soil under these paved areas has not been impacted by historic sandblasting activities. As a result, lead sampling will only be conducted within unpaved areas and excavation beneath paved surfaces will not be required.

Soil samples will be collected in disposable 4-foot acetate sleeves using DPT. Soil samples will be collected in four 1-foot depth intervals (0 to 12 inches, 12 to 24 inches, 24 to 36 inches, and 36 to 48 inches). Samples will be homogenized and placed in laboratory-prepared sampling containers, packed on ice, and shipped overnight to an offsite laboratory. The required containers, holding times, analytical methods, sample identification nomenclature, and quality assurance/quality control (QA/QC) sample collection protocol are indicated in **Table 1**. Samples will be analyzed in a 7-day turnaround time to facilitate review and delineation of the soil removal area in advance of mobilization for completion of the TCRA.

If the 0-12 inch and 12-24 inch samples do not exceed 400 mg/kg of lead in soil, no excavation laterally beyond that sample point will be required. Where necessary, excavation will be completed to the top depth of the first sample that does not exceed 400 mg/kg of lead in soil.

If lead concentrations above 400 mg/kg are not bound (laterally or vertically) by pre-confirmation sampling activities, post-excavation confirmation samples will be collected to confirm excavation activities have removed lead concentrations in soil above 400 mg/kg. Post-excavation samples will be collected from the floor and walls of the excavation, as needed, using a disposable trowel. Samples will be collected from 0-4 inches below the excavation floor or within the side wall. If post-excavation samples exceed 400mg/kg, excavation will continue either laterally or vertically in 6-inch intervals until post-excavation confirmation samples are below 400 mg/kg of lead in soil.

All relevant site-specific observations, onsite conditions, and sampling activities will be logged in the field notebook. Following sample collection, boreholes will be filled with bentonite chips and hydrated. All sampling locations will be surveyed by the field team using a Trimble® Global Positioning System Unit. The horizontal coordinates (x,y) of each sample location will be noted in the field logbook.

Equipment Decontamination

All non-disposable sampling equipment will be decontaminated before use and immediately after each use in accordance with applicable SOPs. Heavy equipment such as DPT equipment (rods or split spoons) will be steam-cleaned before use at each new DPT location. A decontamination pad will be set up to prevent runoff of the

decontamination water and to allow easy collection of decontamination fluids. Decontamination fluids will be contained in 55-gallon drums.

Investigation-derived Waste Management

IDW that is generated during field sampling will include drill cuttings from the soil borings and solutions used to decontaminate non-disposable sampling equipment. IDW will be containerized in approved 55-gallon drums, which will be stored at the approved IDW satellite location, located within ER Site 13. IDW will be characterized prior to disposal at an approved facility.

Data Quality Control

All offsite laboratory analyses will be conducted by a laboratory that has been evaluated and found acceptable by the Department of Defense Environmental Laboratory Accreditation Program. Samples will be analyzed using the methods listed in **Table 1**. Because the analytical data collected during this investigation will be used for risk assessment purposes, QA/QC samples will be collected and data will be validated. The analytical data and method QA/QC criteria will be reviewed by the CH2M HILL data validator. The data validation meets the requirements of the IM-2 Inorganic validation recommended by the EPA for treatability study data. Any method non-conformances will be identified, data will be qualified if needed, and the results will be presented to the project team. The project chemist and project manager will also assess the usability of the data and will assess what impacts any methodology QA/QC issues may have on meeting the PQOs. Finally, the data set as a whole will be examined for consistency, anomalous results, reasonableness, and overall usability.

The data will be loaded into a database and incorporated into the Geographical Information System management system for JEB Little Creek. Data management will include tracking the samples from collection through analysis, obtaining results from the subcontracted laboratory, quality control checks, data validation, and NIRIS data upload.

Reporting

The results of this investigation will be used to delineate the required soil removal area to be excavated during the TCRA at SWMU 3. Data will be documented in a technical memorandum presenting the final removal area to be addressed as part of the TCRA. Documentation of the successful excavation of the removal area will be presented in the construction completion report to be prepared by a separate contractor following the removal action.

References

- CH2M HILL. 2005. *Final Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment for SWMU 3, Pier 10, Sandblast Yard*. August.
- CH2M HILL. 2007. *Master Project Plans, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*. April.
- CH2M HILL. 2009. *Final Supplemental Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*. August.
- CH2M HILL. 2012a. *Final Benthic Invertebrate Evaluation, SWMU 3 – Pier 10 Sandblast Yard, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia*. June.
- CH2M HILL. 2012b. *Final Risk Assessment Update – Evaluation of Future Potable Use of Groundwater and Groundwater Discharge to Surface Water at SWMU 3-Pier 10 Sandblast Yard*. July.
- CH2M HILL. 2012c. *Site Management Plan, Fiscal Years 2013 through 2017, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia*. October.
- CH2M HILL. 2013. *Draft Action Memorandum for Completion of Time-Critical Removal Action at Solid Waste Management Unit 3 – Pier 10 Sandblast Yard, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia*. March.

TABLE 1
Sample Summary
SWMU 3 Soil Sampling Work Plan
JEB Little Creek
Virginia Beach, Virginia

				Analyte	Lead
				Analytical Method	SW846 6010B
				Data Package Turn Around	72 hours (Form I)
				Container Type/Volume	(1) 4 oz jar/4 oz
				Preservative	Cool < 6 degrees C
				Holding Time	180 days
Site	Matrix	Transect	Sample ID	Sample Depth (inches bgs)	
SWMU 3	Soil	A	LW03-A1-SS01-0012-13B	0-12	X
			LW03-A1-SB01-1224-13B	12-24	X
			LW03-A1-SB01-2436-13B	24-36	X
			LW03-A1-SB01-3648-13B	36-48	X
			LW03-A2-SS01-0012-13B	0-12	X
			LW03-A2-SB01-1224-13B	12-24	X
			LW03-A2-SB01-2436-13B	24-36	X
			LW03-A2-SB01-3648-13B	36-48	X
		B	LW03-B1-SS01-0012-13B	0-12	X
			LW03-B1-SB01-1224-13B	12-24	X
			LW03-B1-SB01-2436-13B	24-36	X
			LW03-B1-SB01-3648-13B	36-48	X
			LW03-B2-SS01-0012-13B	0-12	X
			LW03-B2-SB01-1224-13B	12-24	X
			LW03-B2-SB01-2436-13B	24-36	X
			LW03-B2-SB01-3648-13B	36-48	X
		C	LW03-C1-SS01-0012-13B	0-12	X
			LW03-C1-SB01-1224-13B	12-24	X
			LW03-C1-SB01-2436-13B	24-36	X
			LW03-C1-SB01-3648-13B	36-48	X
		D	LW03-D1-SS01-0012-13B	0-12	X
			LW03-D1-SB01-1224-13B	12-24	X
			LW03-D1-SB01-2436-13B	24-36	X
			LW03-D1-SB01-3648-13B	36-48	X
			LW03-D2-SS01-0012-13B	0-12	X
			LW03-D2-SB01-1224-13B	12-24	X
			LW03-D2-SB01-2436-13B	24-36	X
			LW03-D2-SB01-3648-13B	36-48	X
			LW03-D3-SS01-0012-13B	0-12	X
			LW03-D3-SB01-1224-13B	12-24	X
			LW03-D3-SB01-2436-13B	24-36	X
			LW03-D3-SB01-3648-13B	36-48	X
			LW03-D4-SS01-0012-13B	0-12	X
			LW03-D4-SB01-1224-13B	12-24	X
			LW03-D4-SB01-2436-13B	24-36	X
			LW03-D4-SB01-3648-13B	36-48	X
			LW03-D5-SS01-0012-13B	0-12	X
			LW03-D5-SB01-1224-13B	12-24	X
			LW03-D5-SB01-2436-13B	24-36	X
			LW03-D5-SB01-3648-13B	36-48	X

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Site	Matrix	Transect	Sample ID	Sample Depth (inches bgs)	
SWMU 3	Soil	E	LW03-E1-SS01-0012-13B	0-12	X
			LW03-E1-SB01-1224-13B	12-24	X
			LW03-E1-SB01-2436-13B	24-36	X
			LW03-E1-SB01-3648-13B	36-48	X
			LW03-E2-SS01-0012-13B	0-12	X
			LW03-E2-SB01-1224-13B	12-24	X
			LW03-E2-SB01-2436-13B	24-36	X
			LW03-E2-SB01-3648-13B	36-48	X
			LW03-E3-SS01-0012-13B	0-12	X
			LW03-E3-SB01-1224-13B	12-24	X
			LW03-E3-SB01-2436-13B	24-36	X
			LW03-E3-SB01-3648-13B	36-48	X
			LW03-E4-SS01-0012-13B	0-12	X
			LW03-E4-SB01-1224-13B	12-24	X
			LW03-E4-SB01-2436-13B	24-36	X
			LW03-E4-SB01-3648-13B	36-48	X
			LW03-E5-SS01-0012-13B	0-12	X
			LW03-E5-SB01-1224-13B	12-24	X
			LW03-E5-SB01-2436-13B	24-36	X
			LW03-E5-SB01-3648-13B	36-48	X
		F	LW03-F1-SS01-0012-13B	0-12	X
			LW03-F1-SB01-1224-13B	12-24	X
			LW03-F1-SB01-2436-13B	24-36	X
			LW03-F1-SB01-3648-13B	36-48	X
			LW03-F2-SS01-0012-13B	0-12	X
			LW03-F2-SB01-1224-13B	12-24	X
			LW03-F2-SB01-2436-13B	24-36	X
			LW03-F2-SB01-3648-13B	36-48	X
			LW03-F3-SS01-0012-13B	0-12	X
			LW03-F3-SB01-1224-13B	12-24	X
			LW03-F3-SB01-2436-13B	24-36	X
			LW03-F3-SB01-3648-13B	36-48	X
			LW03-F4-SS01-0012-13B	0-12	X
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			LW03-F4-SB01-2436-13B	24-36	X
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			LW03-F5-SS01-0012-13B	0-12	X
			LW03-F5-SB01-1224-13B	12-24	X
			LW03-F5-SB01-2436-13B	24-36	X
			LW03-F5-SB01-3648-13B	36-48	X

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				Container Type/Volume	(1) 4 oz jar/4 oz
				Preservative	Cool < 6 degrees C
				Holding Time	180 days
Site	Matrix	Transect	Sample ID	Sample Depth (inches bgs)	
SWMU 3	Soil	G	LW03-G1-SS01-0012-13B	0-12	X
			LW03-G1-SB01-1224-13B	12-24	X
			LW03-G1-SB01-2436-13B	24-36	X
			LW03-G1-SB01-3648-13B	36-48	X
			LW03-G2-SS01-0012-13B	0-12	X
			LW03-G2-SB01-1224-13B	12-24	X
			LW03-G2-SB01-2436-13B	24-36	X
			LW03-G2-SB01-3648-13B	36-48	X
			LW03-G3-SS01-0012-13B	0-12	X
			LW03-G3-SB01-1224-13B	12-24	X
			LW03-G3-SB01-2436-13B	24-36	X
			LW03-G3-SB01-3648-13B	36-48	X
			LW03-G4-SS01-0012-13B	0-12	X
			LW03-G4-SB01-1224-13B	12-24	X
			LW03-G4-SB01-2436-13B	24-36	X
			LW03-G4-SB01-3648-13B	36-48	X
			LW03-G5-SS01-0012-13B	0-12	X
			LW03-G5-SB01-1224-13B	12-24	X
			LW03-G5-SB01-2436-13B	24-36	X
			LW03-G5-SB01-3648-13B	36-48	X
			LW03-G6-SS01-0012-13B	0-12	X
			LW03-G6-SB01-1224-13B	12-24	X
			LW03-G6-SB01-2436-13B	24-36	X
			LW03-G6-SB01-3648-13B	36-48	X
			LW03-G7-SS01-0012-13B	0-12	X
			LW03-G7-SB01-1224-13B	12-24	X
			LW03-G7-SB01-2436-13B	24-36	X
			LW03-G7-SB01-3648-13B	36-48	X

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Virginia Beach, Virginia

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Site	Matrix	Transect	Sample ID	Sample Depth (inches bgs)	
SWMU 3	Soil	H	LW03-H1-SS01-0012-13B	0-12	X
			LW03-H1-SB01-1224-13B	12-24	X
			LW03-H1-SB01-2436-13B	24-36	X
			LW03-H1-SB01-3648-13B	36-48	X
			LW03-H2-SS01-0012-13B	0-12	X
			LW03-H2-SB01-1224-13B	12-24	X
			LW03-H2-SB01-2436-13B	24-36	X
			LW03-H2-SB01-3648-13B	36-48	X
			LW03-H3-SS01-0012-13B	0-12	X
			LW03-H3-SB01-1224-13B	12-24	X
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			LW03-H3-SB01-3648-13B	36-48	X
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			LW03-H4-SB01-1224-13B	12-24	X
			LW03-H4-SB01-2436-13B	24-36	X
			LW03-H4-SB01-3648-13B	36-48	X
			LW03-H5-SS01-0012-13B	0-12	X
			LW03-H5-SB01-1224-13B	12-24	X
			LW03-H5-SB01-2436-13B	24-36	X
			LW03-H5-SB01-3648-13B	36-48	X
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			LW03-H6-SB01-2436-13B	24-36	X
			LW03-H6-SB01-3648-13B	36-48	X
			LW03-H7-SS01-0012-13B	0-12	X
			LW03-H7-SB01-1224-13B	12-24	X
			LW03-H7-SB01-2436-13B	24-36	X
			LW03-H7-SB01-3648-13B	36-48	X
Field QC Samples					
SWMU 3	Field Duplicate	NA	LW03-X-SX01P-XXXX-13B	XX-XX	X
	Matrix Spike	NA	LW03-X-SX01-XXXX-13B-MS	XX-XX	X
	Matrix Spike Duplicate	NA	LW03-X-SX01-XXXX-13B-MD	XX-XX	X
	Equipment Blank	NA	LW03-EBMMDDYY	NA	X





- Legend**
- Outfall Locations
 - Underground Drain Pipe
 - Picnic Area
 - Fenced Area
 - 1999 Dredging Limits
 - SWMU 3 Study Area Boundary

- Former Sandblasting Area (1962-1995)
- More Recent Sandblasting Area (1995-1996)

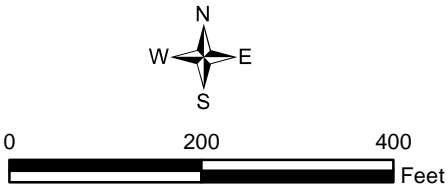
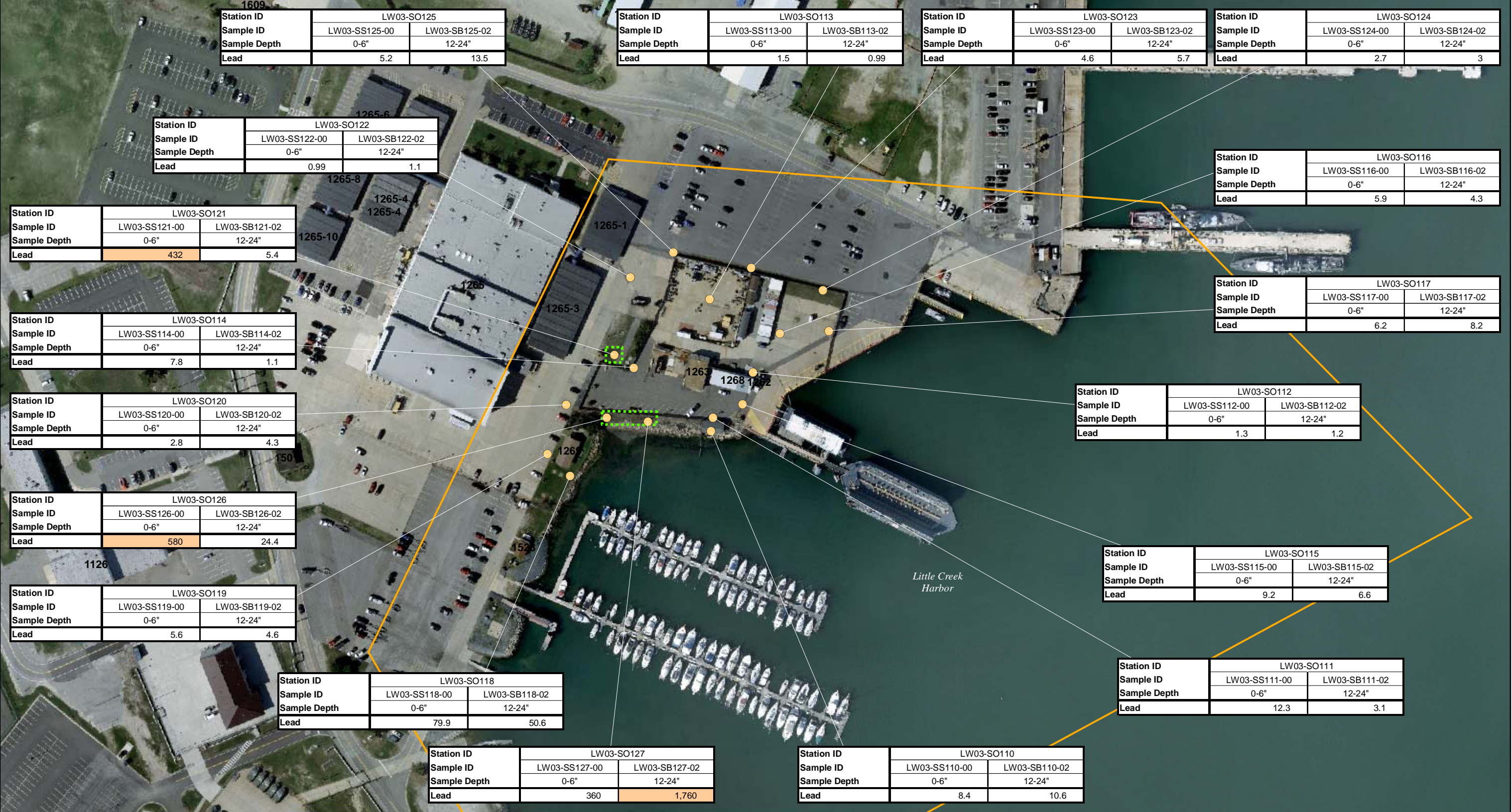


Figure 2
SWMU 3 Boundary and Immediate Vicinity
SWMU 3 Soil Sampling Work Plan
JEB Little Creek
Virginia Beach, Virginia



- Legend**
- Surface/Subsurface Soil Sample Locations
 - SWMU 3 Study Area Boundary
 - ▭ Proposed Soil Removal Area

Shading indicates detections of lead in soil > 400 mg/kg

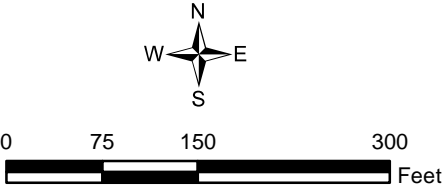
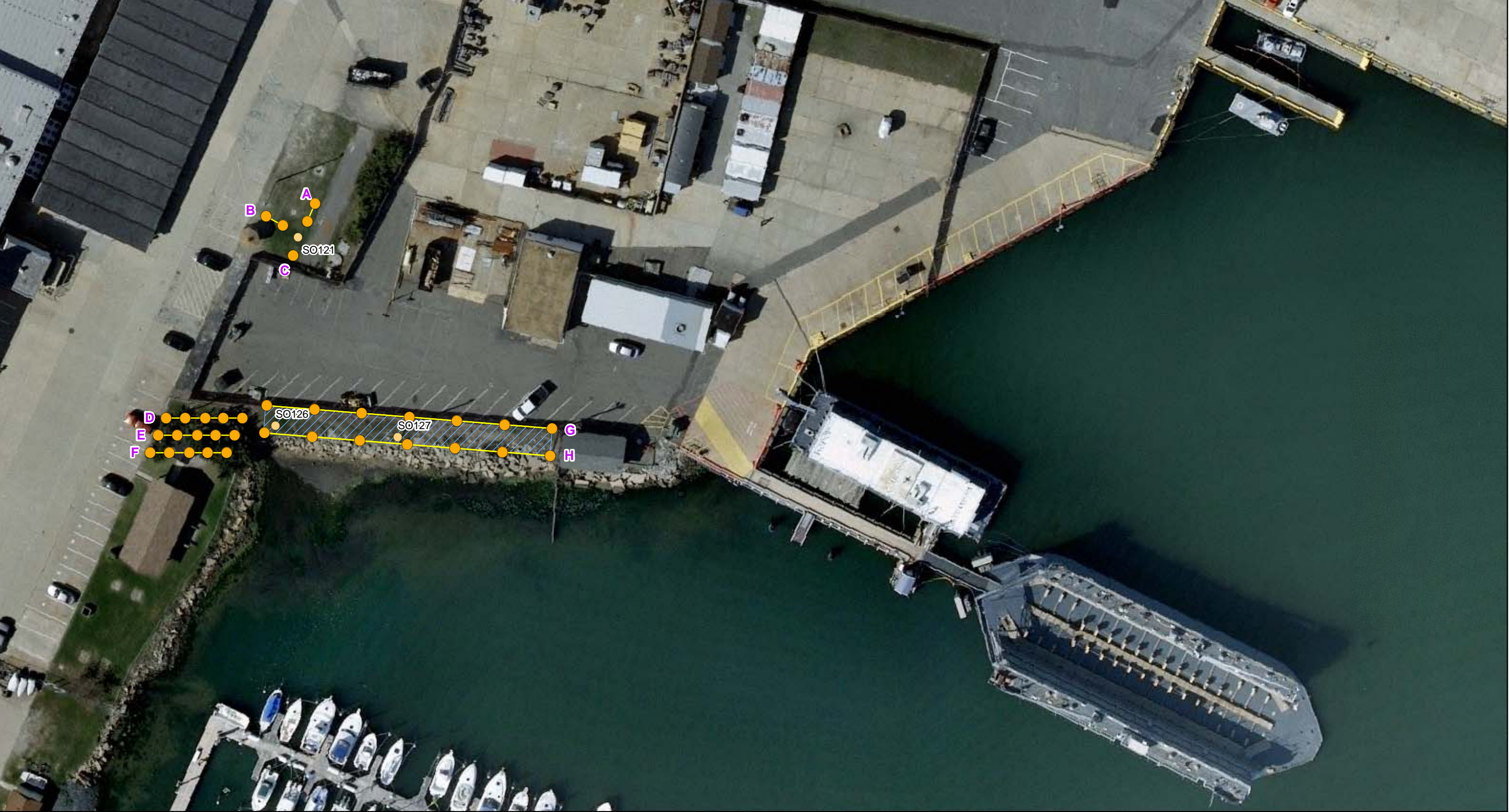


Figure 3
Preliminary Soil Removal Areas
SWMU 3 Soil Sampling Work Plan
JEB Little Creek
Virginia Beach, Virginia



- Legend**
- Surface/Subsurface Soil Sample Locations
 - Proposed Soil Sample Location
 - Sample Location Transect
 - - - Soil Removal Area
 - ▨ Stormwater Retention Feature Area

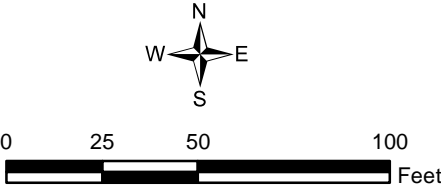


Figure 4
Proposed Soil Sample Locations
SWMU 3 Soil Sampling Work Plan
JEB Little Creek
Virginia Beach, Virginia

Attachment A
Applicable Standard Operating Procedures

Disposal of Waste Fluids and Solids

I. Purpose and Scope

This SOP describes the procedures used to dispose of hazardous fluid and solid materials generated as a result of the site operations. This SOP does not provide guidance on the details of Department of Transportation regulations pertaining to the transport of hazardous wastes; the appropriate Code of Federal Regulations (49 CFR 171 through 177) should be referenced. Also, the site investigation-derived waste management plan should be consulted for additional information and should take precedence over this SOP.

II. Equipment and Materials

A. Fluids

- DOT-approved 55-gallon steel drums or Baker® Tanks
- Tools for securing drum lids
- Funnel for transferring liquid into drum
- Labels
- Paint Pens
- Marking pen for appropriate labels
- Seals for 55-gallon steel drums

B. Solids

- DOT-approved 55-gallon steel drums or rollofs
- Tools for securing drum lids
- Paint Pens
- Plastic sheets
- Labels
- Marking pen for appropriate labels

III. Procedures and Guidelines

A. Methodology

Clean, empty drums or rollofs or Baker® Tanks will be brought to the site by the drilling subcontractor for soil and groundwater collection and storage. The empty drums will be located at the field staging area and moved to drilling locations as required. The drums will be filled with the drilling and well installation wastes, capped, sealed, and moved to the onsite drum storage area by the drilling

subcontractor. The full drums will separate types of wastes by media. The drums will be labeled as they are filled in the field and labels indicating that the contents are pending analysis affixed.

The drum contents will be sampled to determine the disposal requirements of the drilling wastes. The drum sampling will be accomplished through the collection and submittal of composite samples, one sample per 10 drums (check with disposal facility to determine sample frequency) containing the same media. Similar compositing will be performed in each rolloff to obtain a representative sample. The compositing of the sample will be accomplished by collecting a specific volume of the material in each drum into a large sample container. When samples from each of the drums being sampled in a single compositing are collected, the sample will be submitted for TCLP, ignitability, corrosivity, and reactivity analysis. The analysis will be used to determine if drilling wastes are covered by land disposal restrictions.

If rollofs are used, compositing and sampling of soil will comply with applicable state and federal regulations.

B. Labels

Drums and other containers used for storing wastes from drilling operations will be labeled when accumulation in the container begins. Labels will include the following minimum information:

- Container number
- Container contents
- Origin (source area including individuals wells, piezometers, and soil borings)
- Date that accumulation began
- Date that accumulation ended
- Generator Contact Information
- When laboratory results are received, drum labels will be completed or revised to indicate the hazardous waste constituents in compliance with Title 40 of the Code of Federal Regulations, Part 262, Subpart C if the results indicate hazardous waste or labeled as non-hazardous if applicable.

C. Fluids

Drilling fluids generated during soil boring and groundwater discharged during development and purging of the monitoring wells will be collected in 55-gallon, closed-top drums. When a drum is filled, the bung will be secured tightly. Fluids may also be transferred to Baker® Tanks after being temporarily contained in drums to minimize the amount of drums used.

When development and purging is completed, the water will be tested for appropriate hazardous waste constituents. Compositing and sampling of fluids will comply with applicable state and federal regulations.

D. Solids

The soil cuttings from well and boring drilling will constitute a large portion of the solids to be disposed of.

The solid waste stream also will include plastic sheeting used for decontamination pads, Tyveks, disposable sampling materials, and any other disposable material used during the field operations that appears to be contaminated. These materials will be placed in designated drums.

E. Storage and Disposal

The wastes generated at the site at individual locations will be transported to the drum storage area by the drilling services subcontractor. Drums should be stored on pallets on plastic sheeting with a short berm wall (hay bales or 2 x 4 planks or equivalent) to capture small spills.

Waste solid materials that contain hazardous constituents will be disposed of at an offsite location in a manner consistent with applicable solid waste, hazardous waste, and water quality regulations. Transport and disposal will be performed by a commercial firm under subcontract.

The liquid wastes meeting acceptable levels of discharge contamination may be disposed of through the sanitary sewer system at the site. However, prior to disposal to the sanitary sewer system, approval and contract arrangements will be made with the appropriate authorities. Wastes exceeding acceptable levels for disposal through the sanitary sewer system will be disposed of through contract with a commercial transport and disposal firm.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- Check that representative samples of the containerized materials are obtained.
- Be sure that all state and federal regulations are considered when classifying waste for disposal.

Preparing Field Log Books

I. Purpose

This SOP provides general guidelines for entering field data into log books during site investigation and remediation activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement for much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. PROCEDURES FOR COMPLETING FIELD LOG BOOKS

1. Field notes commonly are kept in bound, hard-cover logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and SESCO, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.
2. On the inside cover of the log book the following information should be included:
 - Company name and address
 - Log-holders name if log book was assigned specifically to that person

- Activity or location
 - Project name
 - Project manager's name
 - Phone numbers of the company, supervisors, emergency response, etc.
3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."
 4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.
 5. Daily entries will be made chronologically.
 6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.
 7. Each page of the log book will have the date of the work and the note takers initials.
 8. The final page of each day's notes will include the note-takers signature as well as the date.
 9. Only information relevant to the subject project will be added to the log book.
 10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. INFORMATION TO BE INCLUDED IN FIELD LOG BOOKS

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.
2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.
3. Scope: Describe the general scope of work to be performed each day.
4. Weather: Record the weather conditions and any significant changes in the weather during the day.

5. Tail Gate Safety Meetings: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/problems, and other pertinent information.
6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.
7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.
8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.
9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.
10. Time: Keep a running time log explaining field activities as they occur chronologically throughout the day.
11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.
12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.
13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.
14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.
15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.

16. Any conditions that might adversely affect the work or any data obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).
17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:
 - Description of the general sampling area – site name, buildings and streets in the area, etc.
 - Station/Location identifier
 - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
 - Sample matrix and type
 - Sample date and time
 - Sample identifier
 - Draw a box around the sample ID so that it stands out in the field notes
 - Information on how the sample was collected – distinguish between “grab,” “composite,” and “discrete” samples
 - Number and type of sample containers collected
 - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
 - Parameters to be analyzed for, if appropriate
 - Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. SUGGESTED FORMAT FOR RECORDING FIELD DATA

1. Use the left side border to record times and the remainder of the page to record information (see attached example).
2. Use tables to record sampling information and field data from multiple samples.
3. Sketch sampling locations and other pertinent information.
4. Sketch well construction diagrams.

V. Attachments

Example field notes.

(47)

MAY 12, 2003

EXAMPLE

0715 ARRIVE ON SITE AT XYZ SITE.
CH2M HILL STAFF:
John Smith: FIELD TEAM LEADER
Bob Builder: SITE SAFETY COORD.
WEATHER: OVERCAST + COOL, 45°F
CHANCE OF LATE SHOWERS
SCOPE: • COLLECT GROUNDWATER
SAMPLES FOR LTM WORK AT SITE 14
• SUPERVISE SURVEY CREW
AT SITE 17

0725 BB ~~can~~ ^{JS} Calibrates
PID: 101 ppm / 100 ppm OK
PID Model #, SERIAL #

0730 BB Calibrates HORIBA METER
Model #, SERIAL #
→ List calibration RESULTS

0738 Survey crew ARRIVES on site
→ List NAMES

0745 BB Holds H+S TALK on Slips,
Trips, Falls, Ticks + Air Monitoring
JS + Survey crew ATTEND
No H+S ISSUES IDENTIFIED as
CONCERNS. All work is in "LEVEL D."

0755 JS Conducts site-WIDE Air Monitoring
All readings = 0.0 ppm in

JS
5-12-03

MAY 12, 2003

EXAMPLE

SITE 14 LTM
Breathing Zone (BZ)

0805 Mobilize to well MW-22 to
SAMPLE, Surveyors SETTING UP
AT SITE 17

0815 PM (PAUL PAPER PUSHER) CALLS AND
INFORMS JS to collect GW SAMPLE
AT well MW-44 today for 24 hour
TAT ANALYSIS OF VOC'S

0820 Purging MW-22
→ RECORD WATER QUALITY DATA JS
5-12-03

0843 Collect SAMPLE AT MW-22 for
total TAT Metals AND VOC'S. No
Dissolved Metals Needed per PM

0905 JS + BB Mobilize to site 17 to
show surveyors wells to Survey.

0942 Mobilize to well MW-22 to
Collect SAMPLE...

0950 CAN NOT ACCESS well MW-22
due to BASE OPERATIONS; CONTACT
PAUL PAPER PUSHER AND HE STATED
HE WILL CHECK ON GAINING ACCESS
WITH BASE CONTACT.

0955 Mobilize to well MW-19

JS
5-12-03

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II or lab grade water)
- Millipore™ deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

- A. Decontaminate all sampling equipment that has come in contact with sample according to SOP *Decontamination of Personnel and Equipment*.
- B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

- C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used, remove the disposable tubing after sampling but before decon. When decon is complete, put a 3- to 5-foot segment of new tubing onto the pump to collect the equipment blank.
- D. To collect a field blank, slowly pour ASTM Type II or lab grade water directly into sample containers.
- E. Document and ship samples in accordance with the procedures for other samples.
- F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II or lab grade water.

Sampling Contents of Tanks and Drums

I. Scope and Application

This procedure provides an overview approach and guidelines for the routine sampling of drums and tanks. Its purpose is to describe standard procedures and precautions which are applied in sampling drums and tanks. Procedures for opening drums with the individual instruments are included in Attachment D.

The samples obtained may be used to obtain physical chemical or radiological data. The resulting data may be qualitative or quantitative in nature, and are appropriate for use in preliminary surveys as well as confirmatory sampling.

II. Summary of Methods

Drums are generally sampled by means of sampling tubes such as glass sample tubes or COLIWASA samplers. In either case, the sampling tube is manually inserted into the waste material. A sample of the drum contents is withdrawn by the sampling device. Should a drum contain bottom sludge, a glass tube will be used to retrieve a sample of this as well.

Storage tank and tank trailers, because of their greater depths, require sampling devices that can be lowered from the top, filled at a particular depth, then withdrawn. Such devices are a COLIWASA, a Kemmerer depth sampler, or a Bacon Bomb. Where samples of bottom sludge are desired, a gravity corer can be utilized. This heavy tube with a tapered nose piece will penetrate the sludge as it free falls through the tank.

III. Comments

The sampling of tanks, containers, and drums present unique problems not associated with environmental samples. Containers of this sort are generally closed except for small access ports, manways, or hatches on the larger vessels, or taps and bungs on smaller drums. The physical size, shape, construction material, and location of access limit the types of equipment and methods of collection that can be used.

When liquids are contained in sealed vessels, gas vapor pressure can build up, sludges can settle out, and density layerings (stratification) can develop. Bulging drums may be under pressure and extreme caution should be exercised. The potential exists for explosive reactions or the release of noxious gases when containers are opened. All vessels should be opened with extreme caution. Check the HSP for the level of personnel protection to be worn. A preliminary sampling of

any headspace gases is warranted. As a minimum, a preliminary check with an explosimeter and an organic vapor analyzer may be of aid in selecting a sampling method.

In most cases it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, a sample must be taken that represents the entire depth of the vessel.

IV. Required Equipment and Apparatus

- A. **Health and safety equipment/materials:** As listed in the site safety plan.
- B. **Sampling equipment:** COLIWASA, glass sample tubes, Kemmerer depth sampler, Bacon Bomb, gravity corer.
- C. **Tools:** Rubber mallet, bung wrench, speed wrench with socket, etc., (all non-sparking), paint marker.
- D. **Heavy equipment:** Backhoe equipped with explosion shield, drum grapppler, and 3-foot copper-beryllium (non-sparking) spike with 6-inch collar (to puncture top of drums for sampling, if necessary).
- E. **Sample Containers:** As specified in the field sampling plan.

V. Procedures

A. Drums

NOTE: DO NOT open more than one drum at a time. Each drum must be handled and sampled as a separate entity to reduce vapors in the sampling area.

1. Drums will be sampled on an area-by-area basis. Drums will be sampled after they have been placed in overpack drums but before they are transferred from the excavation to the onsite storage area.
2. Record, in logbook, all pertinent information from visual inspection of drum (e.g., physical condition, leaks, bulges, and labels). Label each drum with a unique identifying number.
3. If possible, stage drums for easy access.
4. If necessary, attach ground strap to drums and grounding point.
5. Remove any standing material (water, etc.) from container top.
6. Using non-sparking tools, carefully remove the bung or lid while monitoring air quality with appropriate instruments. If necessary (and as a last resort), the non-sparking spike affixed to the backhoe can also be used to puncture the drum for sampling. See

Attachment D for method of drum opening. Record air-quality monitoring results.

7. When sampling a previously sealed vessel, a check should be made for the presence of bottom sludge. This is accomplished by measuring the depth to apparent bottom, then comparing it to the known interior depth.
8. Agitation to disrupt the layers and rehomogenize the sample is physically difficult and almost always undesirable. If the vessel is greater than 3 feet in depth (say, a 55-gallon drum), the appropriate sampling method is to slowly lower the sampling device (i.e., suction line of peristaltic pump, glass tube) in known increments of length. Discrete samples can be collected from various depths, then combined or analyzed separately. If the depth of the vessel is greater than the lift capacity of the pump, an at-depth water sampler, such as the Kemmerer or Bacon Bomb type, may be required.
9. Extract a representative sample from the drum using a glass rod, COLIWASA, Bacon Bomb, Kemmerer bottle, or gravity corer (See Attachments). Ensure that the entire depth of material is penetrated. Depending on the size of the opening of the drum, three to four takes should be collected from random locations across the drum surface, to ensure a representative sample. Any observed stratification must be recorded in logbook, including number and thickness of the layers and a conceptualized sketch.
10. Record a visual description of the sample (e.g., liquid, solid, color, viscosity, and percent layers).
11. When possible, sampling equipment (like glass tubes) should be expendable and be left inside the drum for disposal with drum contents, once sampling is completed.
12. Place lid, bung, cap, etc., back in place on drum. Tighten hand tight. If necessary, the sampling port can be sealed using a cork.
13. Wipe up spilled material with lab wipes. Wipe off sample containers.
14. Mark the drum with a unique sample identification number and date using a paint marker.
15. Samples will be handled as high hazard samples. Samples will be placed in containers defined according to the analytical needs, wiped clean, and then packed in paint cans for shipping. Packaging, labeling, and preparation for shipment procedures will follow procedures as specified in the field sampling plan.

B. Underground Storage Tanks

1. A sampling team of at least two people is required for sampling – one will collect samples, the other will relay required equipment and implements.
2. Sampling team will locate a sampling port on the tank. Personnel should be wearing appropriate protective clothing at this time and carrying sampling gear.
3. Do not attempt to climb down into tank. Sampling **MUST BE** accomplished from the top.
4. Collect a sample from the upper, middle, and lower section of the tank contents with one of the recommended sampling devices.
5. If compositing is necessary, ship samples to laboratory in separate containers for laboratory compositing.
6. Samples will be handled as hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

C. Tank Trailers or Above-Ground Storage Tanks

1. A sampling team of two is required. One will collect samples, the other will relay required equipment and implements.
2. Samples will be collected through the manhole (hatch) on top of the tanker or the fill port. Do not open valves at the bottom. Before opening the hatch, check for a pressure gauge or release valve. Open the release valve slowly to bring the tank to atmospheric pressure.
3. If tank pressure is too great, or venting releases large amounts of toxic gas, discontinue venting and sampling immediately. Measure vented gas with organic vapor analyzer and explosimeter.
4. If no release valve exists, slowly loosen hatch cover bolts to relieve pressure in the tank. (Again, stop if pressure is too great.)
5. Once pressure in tank has been relieved, open the hatch and withdraw sample using one of the recommended sampling devices.
6. Sample each trailer compartment.
7. If compositing is necessary, ship samples to laboratory in separate containers for laboratory compositing.
8. Samples will be handled as hazardous. Samples will be placed in appropriate containers and packed with ice in a cooler. Packaging, labeling, and preparation for shipment will follow procedures specified in the field sampling plan.

- D. Refer to Attachment B for procedures for sampling with appropriate devices as follows:

Drum

Glass tube	—	Procedure 1
COLIWASA	—	Procedure 2

Storage Tank and Tank Trailer

COLIWASA	—	Procedure 2
Bacon Bomb	—	Procedure 3
Gravity Corer (for bottom sludge)	—	Procedure 4

VI. Contamination Control

Sampling tools, instruments, and equipment will be protected from sources of contamination prior to use and decontaminated after use as specified in SOP *Decontamination of Personnel and Equipment*. Liquids and materials from decontamination operations will be handled in accordance with the waste management plan. Sample containers will be protected from sources of contamination. Sampling personnel shall wear chemical resistant gloves when handling any samples. Gloves will be decontaminated or disposed of between samples.

VIII. Attachments

- A. Collection of Liquid-Containerized Wastes Using Glass Tubes
- B. Sampling Containerized Wastes Using the Composite Liquid Waste Sample (COLIWASA)
- C. Sampling Containerized Wastes Using the Bacon Bomb Sampler
- D. Gravity Corer for sampling Sludges in Large Containers
- E. Construction of a Typical COLIWASA
- F. Drum Opening Techniques and Equipment

IX. References

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U.S. Environmental Protection Agency, *Characterization of Hazardous Waste Sites – A Method Manual: Volume II, Available Sampling Methods*, USEPA Environmental Monitoring Systems Laboratory, Las Vegas, EPA-600/4-84-076, December, 1984.

Environmental Surveillance Procedures, Quality Control Program, Martin Marietta Energy Systems, ESH/Sub/87-21706/1, Oak Ridge, TN, September 1988.

X. Field Checklist

_____ Sampling Instruments	_____ Labels
_____ Tools	_____ Sampling and Analysis Plan
_____ Rubber Mallet	_____ Health and Safety Plan
_____ Logbook	_____ Decontamination Equipment
_____ Safety Glasses or Monogoggles	_____ Lab Wipes
_____ Safety Shoes	_____ Lab Spatulas or Stainless Steel Spoons
_____ Ice/Cooler, as required	_____ Chemical Preservatives, as required
_____ Custody Seals, as required	_____ Appropriate Containers for Waste and Equipment
_____ Chain-of-Custody Forms	_____ Duct Tape
_____ Drum Labels, as required	_____ Plastic Sheetting
_____ Paint Marker, if drum sampling	
_____ Black Indelible Pen	
_____ Monitoring Instruments	

Attachment A Collection of Liquid-Containerized Wastes Using Glass Tubes

Discussion

Liquid samples from opened containers (i.e., 55-gallon drums) are collected using lengths of glass tubing. The glass tubes are normally 122 centimeters long and 6 to 16 millimeters inside diameter. Larger diameter tubes may be used for more viscous fluids if sampling with the small diameter tube is not adequate. The tubing is broken and discarded in the container after the sample has been collected, eliminating difficult cleanup and disposal problems. This method should not be attempted with less than a two-person sampling team.

Uses

This method provides for a quick, relatively inexpensive means of collecting concentrated containerized wastes. The major disadvantage is from potential sample loss that is especially prevalent when sampling low-viscosity fluids. Splashing can also be a problem and proper protective clothing should always be worn.

Note: A flexible tube with an aspirator attached is an alternative method to the glass tube, and allows various levels to be sampled discretely.

Procedures for Use

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 centimeters extend above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the tube with a safety-gloved thumb or a stopper.
5. Carefully remove the capped tube from the drum. If the tube has passed through more than one layer, the boundary should be apparent in the glass tube.
6. Insert the bottom, uncapped end into the sample container.
7. Partially release the thumb or stopper on the top of the tube and allow the sample to slowly flow into the sample container. If separation of phases is desired, cap off tube before the bottom phase has completely emptied. It may be advisable to have an extra container for "waste," so that the fluid on either side of the phase boundary can be directed into a separate container, allowing collection of pure phase liquids in the sample containers. The liquid remaining after the boundary fluid is removed is collected in yet a third container. NOTE: It is not necessary to put phases in separate containers if analysis of separate phases is not desired.
8. Repeat steps 2 through 6 if more volume is needed to fill the sample container.

9. Remove the tube from the sample container and replace the tube in the drum, breaking it, if necessary, in order to dispose of it in the drum.

Optional Method (if sample of bottom sludge is desired)

1. Remove the cover from the container opening.
2. Insert glass tubing slowly almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 cm extends above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Gently push the tube towards the bottom of the drum into the sludge layer. Do not force it.
5. Cap the top of the tube with a safety-gloved thumb or stopper.
6. Carefully remove the capped tube from the drum and insert the uncapped end into the sample container.
7. Release the thumb or stopper on the top of the tube and allow the sample container to fill to approximately 90 percent of its capacity. If necessary, the sludge plug in the bottom of the tube can be dislodged with the aid of the stainless steel laboratory spatula.
8. Repeat if more volume is needed to fill sample container and recap the tube.

Note:

1. If a reaction is observed when the glass tube is inserted (violent agitation, smoke, light, etc.), the investigators should leave the area immediately.
2. If the glass tube becomes cloudy or smoky after insertion into the drum, the presence of hydrofluoric acid maybe indicated, and a comparable length of rigid plastic tubing should be used to collect the sample.
3. When a solid is encountered in a drum (either layer or bottom sludge) the optional method described above may be used to collect a core of the material, or the material may be collected with a disposable scoop attached to a length of wooden or plastic rod.

Attachment B: Sampling Containerized Wastes using the Composite Liquid Waste Sampler (COLIWASA)

Discussion

The COLIWASA is a much-cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. The sampler is commercially available or can be easily fabricated from a variety of materials, including PVC, glass, or Teflon. In its usual configuration it consists of a 152 cm by 4 cm (inside diameter) section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. See Attachment E: Construction of a COLIWASA.

Uses

The COLIWASA is primarily used to sample containerized liquids. The PVC COLIWASA is reported to be able to sample most containerized liquid wastes except for those containing ketones, nitrobenzene, dimethylformamide, mesityl oxide, and tetrahydrofuran. A glass COLIWASA is able to handle all wastes unable to be sampled with the plastic unit except strong alkali and hydrofluoric acid solutions. Due to the unknown nature of many containerized wastes, it would therefore be advisable to eliminate the use of PVC materials and use samplers composed of glass or Teflon.

The major drawback associated with using a COLIWASA is concern for decontamination and costs. The sampler is difficult, if not impossible, to decontaminate in the field, and its high cost in relation to alternative procedures (glass tubes) makes it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if present, to make sure the neoprene rubber stopper provides a tight closure.
2. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
3. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
4. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

5. Slowly withdraw the sampler from the waste container with one hand while wiping the sampler tube with a laboratory wipe with the other hand. A phase boundary, if present, can be observed through the tube.
6. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
7. Unscrew the T-handle of the sampler and disengage the locking block.

Attachment C: Sampling Containerized Wastes using the Bacon Bomb Sampler

Discussion

The Bacon Bomb is designed for the withdrawal of samples from various levels within a storage tank. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable cover provides a point of attachment for the sample line and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber O-ring acting as the plunger-sealing surface. Stainless steel versions are also available. The volumetric capacity is 8, 16, or 32 oz (237, 473, or 946 ml).

Uses

The Bacon Bomb is a heavy sampler suited best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sampler is needed, the stainless steel version would be used, or any of the samplers could be coated with Teflon.

Procedures for Use

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth.
3. Gradually lower the sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill for a sufficient length of time before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line, being careful not to pull up on the plunger line, thereby accidentally opening the bottom valve.
6. Wipe off the exterior of the sampler body.
7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.

Attachment D: Gravity Corer for Sampling Sludges in Large Containers

Discussion

A gravity corer is a metal tube with a replaceable tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration. Most corers are constructed of brass or steel and many can accept plastic liners and additional weights.

Uses

Corers are capable of collecting samples of most sludges and sediments. They collect essentially undisturbed samples that represent the strata profile that may develop in sediments and sludges during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 75 cm (30 in.) can be attained. Exercise care when using gravity corers in vessels or lagoons that have liners because penetration depths could exceed those of the substrate; this could result in damage to the liner material.

Procedures for Use

1. Attach a precleaned corer to the required length of sample line. Solid braided 5-mm (3/16-in.) nylon line is sufficient; however, 20-mm (3/4-in.) nylon is easier to grasp during hand hoisting. An additional weight can be attached to the outside of the corer if necessary.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through the liquid to the bottom.
4. Retrieve corer with a smooth, continuous, up-lifting motion. Do not bump corer because this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer into stainless steel or Teflon pan (preferred).
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or laboratory spatula.

Attachment E: Construction of a Typical COLIWASA

The sampling tube consists of a 1.52-m (5-ft) by 4.13-cm (1-5/8 in) I.D. translucent plastic pipe, usually polyvinyl chloride (PVC) or borosilicate glass plumbing tube. The closure-locking mechanism consists of a short-length, channeled aluminum bar attached to the sampler's stopper rod by an adjustable swivel. The aluminum bar serves both as a T-handle and lock for the samplers' closure system. When the sampler is in the open position, the handle is placed in the T-position and pushed down against the locking block. This manipulation pushes out the neoprene stopper and opens at the sampling tube. In the closed position, the handle is rotated until one leg of the T is squarely perpendicular against the locking block. This tightly seats the neoprene stopper against the bottom opening of the sampling tube and positively locks the sampler in the closed position. The closure tension can be adjusted by shortening or lengthening the stopper rod by screwing it in or out of the T-handle swivel. The closure system of the sampler consists of a sharply tapered neoprene stopper attached to a 0.95-cm (3/8-in) O.D. rod, usually PVC. The upper end of the stopper rod is connected to the swivel of the aluminum T-handle. The sharply tapered neoprene stopper can be fabricated according to specifications by plastic-products manufacturers at an extremely high price, or it can be made in-house by grinding down the inexpensive stopper with a shop grinder.

COLIWASA samplers are typically made out of plastic or glass. The plastic type consists of translucent plastic (usually PVC) sampling tube. The glass COLIWASA uses borosilicate glass plumbing pipe as the sampling tube and a Teflon plastic stopper rod. For purpose of multiphase sampling, clear plastic or glass is desirable in order to observe the profile of the multiphase liquid.

The sampler is assembled as follows:

- a. Attach the swivel to the T-handle with the 3.18-cm (1-1/4 in) long bolt and secure with the 0.48-cm (3/16-in) National Coarse (NC) washer and lock nut.
- b. Attach the PFTE stopper to one end of the stopper rod and secure with the 0.95-cm (3/8-in) washer and lock nut.
- c. Install the stopper and stopper rod assembly in the sampling tube.
- d. Secure the locking block sleeve on the block with glue or screw. This block can also be fashioned by shaping a solid plastic rod on a lathe to the required dimension.
- e. Position the locking block on top of the sampling tube such that the sleeveless portion of the block fits inside the tube, the sleeve sits against the top end of the tube, and the upper end of the stopper rod slips through the center hole of the block.
- f. Attach the upper end of the stopper rod to the swivel of the T-handle.
- g. Place the sampler in the close position and adjust the tension on the stopper by screwing the T-handle in or out.

Attachment F: Drum Opening Techniques and Equipment ¹

I. Introduction

The opening of closed drums prior to sampling entails considerable risk if not done with the proper techniques, tools, and safety equipment. The potential for vapor exposure, skin exposure due to splash or spraying, or even explosion resulting from sparks produced by friction of the tools against the drum, necessitate caution when opening any closed container. Both manual drum opening and remote drum opening will be discussed in the following paragraphs. When drums are opened manually risks are greater than when opened remotely; for this reason, the remote opening of drums is advised whenever possible.

Prior to sampling, the drums should be staged to allow easy access. Also, any standing water or other material should be removed from the container top so that the representative nature of the sample is not compromised when the container is opened. There is also the possibility of encountering a water-reactive substance.

II. Manual Drum Opening

A. Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium (a non-sparking alloy formulated to reduce the likelihood of sparks). The use of bung wrenches marked "NON SPARKING" is encouraged. However, the use of a "NON SPARKING" wrench does not completely eliminate the possibility of spark being produced. Such a wrench only prevents a spark caused by wrench-to-bung friction, but it cannot prevent sparking between the threads on the drum and the bung.

A simple tool to use, the fitting on the bung wrench matching the bung to be removed is inserted into the bung and the tool is turned counterclockwise to remove the bung. Since the contents of some drums may be under pressure (especially, when the ambient temperature is high), the bung should be turned very slowly. If any hissing is heard, the person opening the drum should back off and wait for the hissing to stop. Since drums under pressure can spray out liquids when opened, the wearing of appropriate eye and skin protection in addition to respiratory protection is critical.

B. Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is

¹ Taken from EPA Training Course: "Sampling for Hazardous Materials," U.S. Environmental Protection Agency, Office of Emergency and Remedial Response Support Division, March 24, 1987.

constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums (i.e., DOT Specification 17E and 17F drums); drums with removable heads must be opened by other means.

Drums are opened with a drum deheader by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote pressure release method prior to using the deheader.

C. Hand Pick or Spike

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike. These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available, whereas the spikes are generally uniquely fabricated 4- foot long poles with a pointed end. Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used for drum opening have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, “sprayers” may result and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

III. Remote Opening

A. Backhoe Spike

The most common means used to open drums remotely for sampling is the use of a metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personnel exposure.

Drums should be “staged,” or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike should be decontaminated after each drum is opened to prevent cross contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This, combined with the normal sampling safety gear, should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system. The hole in the drum can be sealed with a cork.

B. Hydraulic Devices

Recently, remotely operated hydraulic devices have been fabricated to open drums remotely. One such device is discussed here. This device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump that pressurizes oil through a length of hydraulic line. A piercing device with a metal point is attached to the end of this line and is pushed into the drum by the hydraulic pressure. The piercing device can be attached so that a hole for sampling can be made in either the side or the head/lid of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place, if desired, and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

C. Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely. A pneumatic bung remover consists of a compressed air supply (usually SCBA cylinders) that is controlled by a heavy-duty, 2-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill that is adapted to turn a bung fitting (preferably, a bronze-beryllium alloy) selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This attachment and removal procedure is time-consuming and is the major drawback of this device. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

IV. Summary

The opening of closed containers is one of the most hazardous site activities. Maximum efforts would be made to ensure the safety of the sampling team. Proper protective equipment and a general wariness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

Attachment A Collection of Liquid-Containerized Wastes Using Glass Tubes

Discussion

Liquid samples from opened containers (i.e., 55-gallon drums) are collected using lengths of glass tubing. The glass tubes are normally 122 centimeters long and 6 to 16 millimeters inside diameter. Larger diameter tubes may be used for more viscous fluids if sampling with the small diameter tube is not adequate. The tubing is broken and discarded in the container after the sample has been collected, eliminating difficult cleanup and disposal problems. This method should not be attempted with less than a two-person sampling team.

Uses

This method provides for a quick, relatively inexpensive means of collecting concentrated containerized wastes. The major disadvantage is from potential sample loss that is especially prevalent when sampling low-viscosity fluids. Splashing can also be a problem and proper protective clothing should always be worn.

Note: A flexible tube with an aspirator attached is an alternative method to the glass tube, and allows various levels to be sampled discretely.

Procedures for Use

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 centimeters extend above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the tube with a safety-gloved thumb or a stopper.
5. Carefully remove the capped tube from the drum. If the tube has passed through more than one layer, the boundary should be apparent in the glass tube.
6. Insert the bottom, uncapped end into the sample container.
7. Partially release the thumb or stopper on the top of the tube and allow the sample to slowly flow into the sample container. If separation of phases is desired, cap off tube before the bottom phase has completely emptied. It may be advisable to have an extra container for "waste," so that the fluid on either side of the phase boundary can be directed into a separate container, allowing collection of pure phase liquids in the sample containers. The liquid remaining after the boundary fluid is removed is collected in yet a third container. NOTE: It is not necessary to put phases in separate containers if analysis of separate phases is not desired.
8. Repeat steps 2 through 6 if more volume is needed to fill the sample container.

9. Remove the tube from the sample container and replace the tube in the drum, breaking it, if necessary, in order to dispose of it in the drum.

Optional Method (if sample of bottom sludge is desired)

1. Remove the cover from the container opening.
2. Insert glass tubing slowly almost to the bottom of the container. Tubing should be of sufficient length so that at least 30 cm extends above the top of the container.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Gently push the tube towards the bottom of the drum into the sludge layer. Do not force it.
5. Cap the top of the tube with a safety-gloved thumb or stopper.
6. Carefully remove the capped tube from the drum and insert the uncapped end into the sample container.
7. Release the thumb or stopper on the top of the tube and allow the sample container to fill to approximately 90 percent of its capacity. If necessary, the sludge plug in the bottom of the tube can be dislodged with the aid of the stainless steel laboratory spatula.
8. Repeat if more volume is needed to fill sample container and recap the tube.

Note:

1. If a reaction is observed when the glass tube is inserted (violent agitation, smoke, light, etc.), the investigators should leave the area immediately.
2. If the glass tube becomes cloudy or smoky after insertion into the drum, the presence of hydrofluoric acid maybe indicated, and a comparable length of rigid plastic tubing should be used to collect the sample.
3. When a solid is encountered in a drum (either layer or bottom sludge) the optional method described above may be used to collect a core of the material, or the material may be collected with a disposable scoop attached to a length of wooden or plastic rod.

Attachment B: Sampling Containerized Wastes using the Composite Liquid Waste Sampler (COLIWASA)

Discussion

The COLIWASA is a much-cited sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. The sampler is commercially available or can be easily fabricated from a variety of materials, including PVC, glass, or Teflon. In its usual configuration it consists of a 152 cm by 4 cm (inside diameter) section of tubing with a neoprene stopper at one end attached by a rod running the length of the tube to a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. See Attachment E: Construction of a COLIWASA.

Uses

The COLIWASA is primarily used to sample containerized liquids. The PVC COLIWASA is reported to be able to sample most containerized liquid wastes except for those containing ketones, nitrobenzene, dimethylformamide, mesityl oxide, and tetrahydrofuran. A glass COLIWASA is able to handle all wastes unable to be sampled with the plastic unit except strong alkali and hydrofluoric acid solutions. Due to the unknown nature of many containerized wastes, it would therefore be advisable to eliminate the use of PVC materials and use samplers composed of glass or Teflon.

The major drawback associated with using a COLIWASA is concern for decontamination and costs. The sampler is difficult, if not impossible, to decontaminate in the field, and its high cost in relation to alternative procedures (glass tubes) makes it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Check to make sure the sampler is functioning properly. Adjust the locking mechanism, if present, to make sure the neoprene rubber stopper provides a tight closure.
2. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
3. Slowly lower the sampler into the liquid waste. Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a non-representative sample.
4. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.

5. Slowly withdraw the sampler from the waste container with one hand while wiping the sampler tube with a laboratory wipe with the other hand. A phase boundary, if present, can be observed through the tube.
6. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
7. Unscrew the T-handle of the sampler and disengage the locking block.

Attachment C: Sampling Containerized Wastes using the Bacon Bomb Sampler

Discussion

The Bacon Bomb is designed for the withdrawal of samples from various levels within a storage tank. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable cover provides a point of attachment for the sample line and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber O-ring acting as the plunger-sealing surface. Stainless steel versions are also available. The volumetric capacity is 8, 16, or 32 oz (237, 473, or 946 ml).

Uses

The Bacon Bomb is a heavy sampler suited best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sampler is needed, the stainless steel version would be used, or any of the samplers could be coated with Teflon.

Procedures for Use

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth.
3. Gradually lower the sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill for a sufficient length of time before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line, being careful not to pull up on the plunger line, thereby accidentally opening the bottom valve.
6. Wipe off the exterior of the sampler body.
7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.

Attachment D: Gravity Corer for Sampling Sludges in Large Containers

Discussion

A gravity corer is a metal tube with a replaceable tapered nosepiece on the bottom and a ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration. Most corers are constructed of brass or steel and many can accept plastic liners and additional weights.

Uses

Corers are capable of collecting samples of most sludges and sediments. They collect essentially undisturbed samples that represent the strata profile that may develop in sediments and sludges during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 75 cm (30 in.) can be attained. Exercise care when using gravity corers in vessels or lagoons that have liners because penetration depths could exceed those of the substrate; this could result in damage to the liner material.

Procedures for Use

1. Attach a precleaned corer to the required length of sample line. Solid braided 5-mm (3/16-in.) nylon line is sufficient; however, 20-mm (3/4-in.) nylon is easier to grasp during hand hoisting. An additional weight can be attached to the outside of the corer if necessary.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through the liquid to the bottom.
4. Retrieve corer with a smooth, continuous, up-lifting motion. Do not bump corer because this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer into stainless steel or Teflon pan (preferred).
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or laboratory spatula.

Attachment E: Construction of a Typical COLIWASA

The sampling tube consists of a 1.52-m (5-ft) by 4.13-cm (1-5/8 in) I.D. translucent plastic pipe, usually polyvinyl chloride (PVC) or borosilicate glass plumbing tube. The closure-locking mechanism consists of a short-length, channeled aluminum bar attached to the sampler's stopper rod by an adjustable swivel. The aluminum bar serves both as a T-handle and lock for the samplers' closure system. When the sampler is in the open position, the handle is placed in the T-position and pushed down against the locking block. This manipulation pushes out the neoprene stopper and opens at the sampling tube. In the closed position, the handle is rotated until one leg of the T is squarely perpendicular against the locking block. This tightly seats the neoprene stopper against the bottom opening of the sampling tube and positively locks the sampler in the closed position. The closure tension can be adjusted by shortening or lengthening the stopper rod by screwing it in or out of the T-handle swivel. The closure system of the sampler consists of a sharply tapered neoprene stopper attached to a 0.95-cm (3/8-in) O.D. rod, usually PVC. The upper end of the stopper rod is connected to the swivel of the aluminum T-handle. The sharply tapered neoprene stopper can be fabricated according to specifications by plastic-products manufacturers at an extremely high price, or it can be made in-house by grinding down the inexpensive stopper with a shop grinder.

COLIWASA samplers are typically made out of plastic or glass. The plastic type consists of translucent plastic (usually PVC) sampling tube. The glass COLIWASA uses borosilicate glass plumbing pipe as the sampling tube and a Teflon plastic stopper rod. For purpose of multiphase sampling, clear plastic or glass is desirable in order to observe the profile of the multiphase liquid.

The sampler is assembled as follows:

- a. Attach the swivel to the T-handle with the 3.18-cm (1-1/4 in) long bolt and secure with the 0.48-cm (3/16-in) National Coarse (NC) washer and lock nut.
- b. Attach the PFTE stopper to one end of the stopper rod and secure with the 0.95-cm (3/8-in) washer and lock nut.
- c. Install the stopper and stopper rod assembly in the sampling tube.
- d. Secure the locking block sleeve on the block with glue or screw. This block can also be fashioned by shaping a solid plastic rod on a lathe to the required dimension.
- e. Position the locking block on top of the sampling tube such that the sleeveless portion of the block fits inside the tube, the sleeve sits against the top end of the tube, and the upper end of the stopper rod slips through the center hole of the block.
- f. Attach the upper end of the stopper rod to the swivel of the T-handle.
- g. Place the sampler in the close position and adjust the tension on the stopper by screwing the T-handle in or out.

Attachment F: Drum Opening Techniques and Equipment ¹

I. Introduction

The opening of closed drums prior to sampling entails considerable risk if not done with the proper techniques, tools, and safety equipment. The potential for vapor exposure, skin exposure due to splash or spraying, or even explosion resulting from sparks produced by friction of the tools against the drum, necessitate caution when opening any closed container. Both manual drum opening and remote drum opening will be discussed in the following paragraphs. When drums are opened manually risks are greater than when opened remotely; for this reason, the remote opening of drums is advised whenever possible.

Prior to sampling, the drums should be staged to allow easy access. Also, any standing water or other material should be removed from the container top so that the representative nature of the sample is not compromised when the container is opened. There is also the possibility of encountering a water-reactive substance.

II. Manual Drum Opening

A. Bung Wrench

A common method for opening drums manually is using a universal bung wrench. These wrenches have fittings made to remove nearly all commonly encountered bungs. They are usually constructed of cast iron, brass, or a bronze-beryllium (a non-sparking alloy formulated to reduce the likelihood of sparks). The use of bung wrenches marked "NON SPARKING" is encouraged. However, the use of a "NON SPARKING" wrench does not completely eliminate the possibility of spark being produced. Such a wrench only prevents a spark caused by wrench-to-bung friction, but it cannot prevent sparking between the threads on the drum and the bung.

A simple tool to use, the fitting on the bung wrench matching the bung to be removed is inserted into the bung and the tool is turned counterclockwise to remove the bung. Since the contents of some drums may be under pressure (especially, when the ambient temperature is high), the bung should be turned very slowly. If any hissing is heard, the person opening the drum should back off and wait for the hissing to stop. Since drums under pressure can spray out liquids when opened, the wearing of appropriate eye and skin protection in addition to respiratory protection is critical.

B. Drum Deheader

One means by which a drum can be opened manually when a bung is not removable with a bung wrench is by using a drum deheader. This tool is

¹ Taken from EPA Training Course: "Sampling for Hazardous Materials," U.S. Environmental Protection Agency, Office of Emergency and Remedial Response Support Division, March 24, 1987.

constructed of forged steel with an alloy steel blade and is designed to cut the lid of a drum off or part way off by means of a scissors-like cutting action. A limitation of this device is that it can be attached only to closed head drums (i.e., DOT Specification 17E and 17F drums); drums with removable heads must be opened by other means.

Drums are opened with a drum deheader by first positioning the cutting edge just inside the top chime and then tightening the adjustment screw so that the deheader is held against the side of the drum. Moving the handle of the deheader up and down while sliding the deheader along the chime will enable the entire top to be rapidly cut off if so desired. If the top chime of a drum has been damaged or badly dented it may not be possible to cut the entire top off. Since there is always the possibility that a drum may be under pressure, the initial cut should be made very slowly to allow for the gradual release of any built-up pressure. A safer technique would be to employ a remote pressure release method prior to using the deheader.

C. Hand Pick or Spike

When a drum must be opened and neither a bung wrench nor a drum deheader is suitable, then it can be opened for sampling by using a hand pick, pickaxe, or spike. These tools are usually constructed of brass or a non-sparking alloy with a sharpened point that can penetrate the drum lid or head when the tool is swung. The hand picks or pickaxes that are most commonly used are commercially available, whereas the spikes are generally uniquely fabricated 4- foot long poles with a pointed end. Often the drum lid or head must be hit with a great deal of force in order to penetrate it. Because of this, the potential for splash or spraying is greater than with other opening methods and therefore this method of drum opening is not recommended, particularly when opening drums containing liquids. Some spikes used for drum opening have been modified by the addition of a circular splash plate near the penetrating end. This plate acts as a shield and reduces the amount of splash in the direction of the person using the spike. Even with this shield, good splash gear is essential.

Since drums, some of which may be under pressure, cannot be opened slowly with these tools, "sprayers" may result and appropriate safety measures must be taken. The pick or spike should be decontaminated after each drum is opened to avoid cross contamination and/or adverse chemical reaction from incompatible materials.

III. Remote Opening

A. Backhoe Spike

The most common means used to open drums remotely for sampling is the use of a metal spike attached or welded to a backhoe bucket. In addition to being very efficient, this method can greatly reduce the likelihood of personnel exposure.

Drums should be "staged," or placed in rows with adequate aisle space to allow ease in backhoe maneuvering. Once staged, the drums can be quickly opened by punching a hole in the drum head or lid with the spike.

The spike should be decontaminated after each drum is opened to prevent cross contamination. Even though some splash or spray may occur when this method is used, the operator of the backhoe can be protected by mounting a large shatter-resistant shield in front of the operator's cage. This, combined with the normal sampling safety gear, should be sufficient to protect the operator. Additional respiratory protection can be afforded by providing the operator with an on-board airline system. The hole in the drum can be sealed with a cork.

B. Hydraulic Devices

Recently, remotely operated hydraulic devices have been fabricated to open drums remotely. One such device is discussed here. This device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump that pressurizes oil through a length of hydraulic line. A piercing device with a metal point is attached to the end of this line and is pushed into the drum by the hydraulic pressure. The piercing device can be attached so that a hole for sampling can be made in either the side or the head/lid of the drum. Some of the metal piercers are hollow or tube-like so that they can be left in place, if desired, and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.

C. Pneumatic Devices

Pneumatically-operated devices utilizing compressed air have been designed to remove drum bungs remotely. A pneumatic bung remover consists of a compressed air supply (usually SCBA cylinders) that is controlled by a heavy-duty, 2-stage regulator. A high pressure air line of desired length delivers compressed air to a pneumatic drill that is adapted to turn a bung fitting (preferably, a bronze-beryllium alloy) selected to fit the bung to be removed. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. This attachment and removal procedure is time-consuming and is the major drawback of this device. This remote bung opener does not permit the slow venting of the container, and therefore appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed with this device.

IV. Summary

The opening of closed containers is one of the most hazardous site activities. Maximum efforts would be made to ensure the safety of the sampling team. Proper protective equipment and a general wariness of the possible dangers will minimize the risk inherent to sampling operations. Employing proper drum opening techniques and equipment will also safeguard personnel. The use of remote sampling equipment whenever feasible is highly recommended.

Chain-of-Custody

I Purpose

The purpose of this SOP is to provide information on chain-of-custody procedures to be used under the CLEAN Program.

II Scope

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities (except wellhead samples taken for measurement of field parameters). Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over region specific or site-specific requirements for chain-of-custody.

III Definitions

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under one's custody if:

- It is in one's actual possession.
- It is in one's view, after being in one's physical possession.
- It was in one's physical possession and then he/she locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

IV. Procedures

The term “chain-of-custody” refers to procedures which ensure that evidence presented in a court of law is valid. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom, as well as providing security for the evidence as it is moved and/or passed from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain-of-possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

Sample Identification

The method of identification of a sample depends on the type of measurement or analysis performed. When *in situ* measurements are made, the data are recorded directly in bound logbooks or other field data records with identifying information.

Information which shall be recorded in the field logbook, when in-situ measurements or samples for laboratory analysis are collected, includes:

- Field Sampler(s),
- Contract Task Order (CTO) Number,
- Project Sample Number,
- Sample location or sampling station number,
- Date and time of sample collection and/or measurement,
- Field observations,
- Equipment used to collect samples and measurements, and
- Calibration data for equipment used

Measurements and observations shall be recorded using waterproof ink.

Sample Label

Samples, other than for *in situ* measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling and Analysis Plan. Each sample container is identified by a sample label (see Attachment A). Sample labels are provided, along with sample containers, by the analytical laboratory. The information recorded on the sample label includes:

- Project - CTO Number.
- Station Location - The unique sample number identifying this sample.
- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 08/21/12).

- Time - A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type and quantity of preservation added.
- Analysis - VOA, BNAs, PCBs, pesticides, metals, cyanide, other.
- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

Using only the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing the analysis from knowing the identity of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site). The field team should always follow the sample ID system prepared by the project EIS and reviewed by the Project Manager.

Chain-of-Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed.

Field Custody Procedures

- Samples are collected as described in the site Sampling and Analysis Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the Chain-of-Custody Record exactly.
- A Chain-of-Custody Record will be prepared for each individual cooler shipped and will include *only* the samples contained within that particular cooler. The Chain-of-Custody Record for that cooler will then be sealed in a zip-log bag and placed in the cooler prior to sealing. This ensures that the laboratory properly attributes trip blanks with the correct cooler and allows for easier tracking should a cooler become lost during transit.
- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.
- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once downloaded to the server or developed, the electronic files or photographic prints shall be serially numbered, corresponding to the logbook descriptions; photographic prints will be stored in the project files. To identify

sample locations in photographs, an easily read sign with the appropriate sample location number should be included.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions (e.g., a logbook notation would explain that a pencil was used to fill out the sample label if the pen would not function in freezing weather.)

Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. **A Chain-of-Custody Record Form must be completed for each cooler and should include only the samples contained within that cooler.** A Chain-of-Custody Record Form example is shown in Attachment B. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as given below:

- Enter header information (CTO number, samplers, and project name).
- Enter sample specific information (sample number, media, sample analysis required and analytical method grab or composite, number and type of sample containers, and date/time sample was collected).
- Sign, date, and enter the time under “Relinquished by” entry.
- Have the person receiving the sample sign the “Received by” entry. If shipping samples by a common carrier, print the carrier to be used in this space (i.e., Federal Express).
- If a carrier is used, enter the airbill number under “Remarks,” in the bottom right corner;
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in a plastic zipper-type bag or other appropriate sample-shipping package. Retain the copy with field records.
- Sign and date the custody seal, a 1-inch by 3-inch white paper label with black lettering and an adhesive backing. Attachment C is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seal across the shipping container opening (front and back) so that it would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the shipping container (enclosed with other documentation in a plastic zipper-type bag). As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

V Quality Assurance Records


Once samples have been packaged and shipped, the Chain-of-Custody copy and airbill receipt become part of the quality assurance record.

VI Attachments

- A. Sample Label
- B. Chain of Custody Form
- C. Custody Seal

VII References

USEPA. *User's Guide to the Contract Laboratory Program*. Office of Emergency and Remedial Response, Washington, D.C. (EPA/540/P-91/002), January 1991.

	 Quality Analytical Laboratories, Inc. 2567 Fairlane Drive Montgomery, Alabama 36116 PH. (334)271-2440
	Client _____
	Sample No. _____
	Location _____
	Analysis _____
	Preservative <u>HCL</u> _____
	Date _____ By _____

CEIMIC CORPORATION 10 Dean Knapp Drive, Narragansett, R.I. 02882 • (401) 782-8900	
SITE NAME _____	DATE _____
ANALYSIS _____	TIME _____
	PRESERVATIVE _____
SAMPLE TYPE <input type="checkbox"/> Grab <input type="checkbox"/> Composite <input type="checkbox"/> Other _____	
COLLECTED BY: _____	

CH2M Hill Project #		Purchase Order #		# O F C O N T A I N E R S	LAB TEST CODES										SHADED AREA— FOR LAB USE ONLY					
															Lab 1 #		Lab 2 #			
Project Name															Quote #		Kit Request #			
Company Name CH2M HILL Office															Project #					
Project Manager & Phone # Mr. [] Ms. [] Dr. []		Report Copy to:													No. of Samples				Page of	
Requested Completion Date:		Sampling Requirements SDWA <input type="checkbox"/> NPDES <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER <input type="checkbox"/>			Sample Disposal: Dispose <input type="checkbox"/> Return <input type="checkbox"/>		Login				LIMS Ver									
Sampling		Type COM P G R A B			Matrix W A T E R S O I L A I R		CLIENT SAMPLE ID (9 CHARACTERS)										REMARKS		LAB 1 ID	LAB 2 ID
Date Time																				
Sampled By & Title (Please sign and print name)					Date/Time		Relinquished By (Please sign and print name)				Date/Time		QC Level: 1 2 3 Other: _____ COC Rec ICE Ans Req TEMP Cust Seal Ph							
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Received By (Please sign and print name)				Date/Time		Shipped Via UPS BUS Fed-Ex Hand Other _____				Shipping #										
Work Authorized By (Please sign and print name)				Remarks																



CUSTODY SEAL

Date

Signature

Homogenization of Soil and Sediment Samples

I. Purpose

The homogenization of soil and sediment samples is performed to minimize any bias of sample representativeness introduced by the natural stratification of constituents within the sample.

II. Scope

Standard techniques for soil and sediment homogenization and equipment are provided in this SOP. These procedures do not apply to aliquots collected for VOCs or field GC screening; samples for these analyses should NOT be homogenized.

III. Equipment and Materials

Sample containers, stainless steel spoons or spatulas, and stainless steel pans.

IV. Procedures and Guidelines

Soil and sediment samples to be analyzed for semivolatiles, pesticides, PCBs, metals, cyanide, or field XRF screening should be homogenized in the field. After a sample is taken, a stainless steel spatula should be used to remove the sample from the split spoon or other sampling device. The sampler should not use fingers to do this, as gloves may introduce organic interferences into the sample.

Samples for VOCs should be taken immediately upon collection and should not be homogenized.

Prior to homogenizing the soil or sediment sample, any rocks, twigs, leaves, or other debris should be removed from the sample. The sample should be placed in a decontaminated stainless steel pan and thoroughly mixed using a stainless steel spoon. The soil or sediment material in the pan should be scraped from the sides, corners, and bottom, rolled into the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the pan. Each quarter of the sample should be mixed individually, and then rolled to the center of the pan and mixed with the entire sample again.

All stainless steel spoons, spatulas, and pans must be decontaminated following procedures specified in SOP *Decontamination of Personnel and Equipment* prior to homogenizing the sample. A composite equipment rinse blank of homogenization equipment should be taken each day it is used.

V. Attachments

None.

VI. Key Checks and Items

- Take VOC samples immediately and do not homogenize the soil.
- Homogenize soil for analyses other than VOCs in a clean, stainless steel bowl.

Direct-Push Soil Sample Collection

I. Purpose

To provide a general guideline for the collection of soil samples using direct-push (e.g., Geoprobe®) sampling methods.

II. Scope

Standard direct-push (e.g., Geoprobe®) soil sampling methods.

III. Equipment and Materials

- Truck-mounted hydraulic percussion hammer
- Sampling rods
- Sampling tubes and acetate liners
- Pre-cleaned sample containers and stainless-steel sampling implements
- Personal Protective Equipment as specified by the Health and Safety Plan

IV. Procedures and Guidelines

1. Decontaminate sampling tubes and other non-dedicated downhole equipment in accordance with SOP *Decontamination of Personnel and Equipment*.
2. Drive sampling tube to the desired sampling depth using the truck-mounted hydraulic percussion hammer. If soil above the desired depth is not to be sampled, first drive the lead rod, without a sampling tube, to the top of the desired depth.
3. Remove the rods and sampling tube from the borehole and remove the sampling tube from the lead rod.
4. Cut open the acetate liner using a specific knife designed to slice the acetate liners (see below).



5. Fill all sample containers, beginning with the containers for VOC analysis, using a decontaminated or dedicated sampling implement. For the VOC samples, place the sample into a pre-preserved VOA vial or direct sample container such as an **En Core®** or **Terra Core®** sampler and seal the cap tightly. Ideally, the operation should be completed in one minute. Label the vials and place on ice for shipment to the laboratory.
6. Decontaminate all non-dedicated downhole equipment (rods, sampling tubes, etc.) in accordance with SOP *Decontamination of Personnel and Equipment*.
7. Backfill borehole at each sampling location with grout or bentonite and repair the surface with like material (bentonite, asphalt patch, concrete, etc.), as required.

V. Key Checks and Items

1. Verify that the hydraulic percussion hammer is clean and in proper working order.
2. Ensure that the direct-push operator thoroughly completes the decontamination process between sampling locations.
3. Verify that the borehole made during sampling activities has been properly backfilled.